Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Inquiry Concerning Deployment of Advanced	)	GN Docket No. 17-199
Telecommunications Capability to All	)	
Americans in a Reasonable and Timely Fashion	)	

COMMENTS OF MICROSOFT CORPORATION

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SUMMARY

- The Commission should establish benchmarks for defining advanced telecommunications capability in a manner that aspires to improvements over the status quo.

- Slow internet speeds and lack of broadband availability operate as a drag on technological development as well as adoption of new technologies and devices. Higher speeds and more ambient broadband connectivity will generate greater benefits and facilitate a more beneficial experience for individuals and small businesses as they increasingly migrate to cloud-based computing.

- Affordability of advanced telecommunications capability is a critical component of a determination of availability. Accordingly, the Commission should measure affordability.

- Mobile broadband and fixed broadband services currently are complementary, rather than substitutable, ways to achieve advanced telecommunications capability and should not be conflated in the Commission's measurements at this time. Common restrictions on mobile usage such as tethering prohibitions and data caps as well as generally lower speeds result in use case scenarios that differ from those afforded via most fixed connections. If the Commission were to conflate the two, which it should not do at this time, it would be well-advised to use the same method of measuring speed and the same geographic units for both.

- More than two-thirds of Americans without a broadband connection live in rural areas. The Commission should support and promote the use of TV White Spaces to increase the affordability of private sector broadband deployments to rural America by:

    - ensuring that at least three channels in the UHF frequency band below 700 MHz are available for wireless use on an unlicensed basis in every market in the country, with additional TV white spaces available in smaller markets and rural areas;

    - accelerating the collection and public reporting on the state of broadband coverage in rural counties, thereby aiding policy makers and the private sector in targeting investments; and

    - designing infrastructure investment programs, such as the CAF, so that they support use of unlicensed frequencies to deliver broadband to rural Americans.

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Although tens of millions of Americans lack broadband service, particularly in rural America, some of the proposals in the Notice would constitute, at best, generally accepting the status quo for the state of broadband in America and, at worst, lowering the bar for defining advanced telecommunications capability.[1] Instead, the Commission should take quick and aggressive action to increase the availability and the affordability of ***both*** fixed and mobile broadband internet access service to all Americans through all parts of the United States since neither currently substitutes for the other. Also, in defining what constitutes advanced telecommunications capability, it should consider increasing fixed and mobile broadband speeds beyond existing levels so that American consumers can more readily utilize new and developing technologies. In making an availability determination, the Commission should recognize that advanced telecommunications capability is not available if it's not affordable. Finally, the Commission should take immediate steps to enable deployment of advanced

[1] *Inquiry Concerning Deployment of Advanced Telecommunications Capability to all Americans in a Reasonable and Timely Fashion*, GN Docket No. 17-199, Thirteenth Section 706 Report Notice of Inquiry, FCC 17-109 (rel. Aug. 8, 2017) ("Notice").

telecommunications capabilities to rural Americans via TV White Spaces and other unlicensed spectrum.

I. The Commission Must Relentlessly Push for Faster Internet Speeds to Permit Continued Technological Advancement.

Section 706 is the Communications Act's ambition for the future. Accordingly, it should be approached with inspiration, enthusiasm, and the understanding that we, as a nation, can continually reach for more and accomplish more. It represents a directive and expectation for relentless and persistent pursuit of continual improvements in this country's telecommunications underpinnings. Section 706 embodies a national goal to have a continually evolving, ever-improving broadband connectivity structure in order to support a variety of important social and economic goals including an ever-evolving, ever-improving technology sector.[2] It should not rest on defining "advanced telecommunications capability" by the more static and laggard measurement of what a majority of Americans currently use.

The progress and adoption of technology in the United States depends in part on the availability and affordability of sufficient bandwidth and internet speed. Online video streaming offers an example. In 1993, dial-up speeds were 56 kbps and a low-quality movie (*e.g.,* not high definition) would take 28 hours to download.[3] At those speeds, the internet didn't offer a viable model for streaming video. Even as internet speeds increased into the early 2000s, most consumers could expect to spend more time watching a buffering wheel than

[2] Indeed, the preamble to the Telecommunications Act of 1996 states that it is the policy of Congress (and, thus, of the Commission) to "promote the continued development of the Internet." Preamble, Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996).

[3] *See* Brian Patrick Eha, "An Accelerated History of Internet Speed (Infographic)," Entrepreneur (Sept. 23, 2013), available at < https://www.entrepreneur.com/article/228489#>.

watching content. The technology's widescale adoption was delayed, in part, by the download speeds that typical consumers could expect to receive from their internet service providers.[4] In fact, HTTP-adaptive bitrate streaming technology was developed to overcome the barrier of slow internet speeds. Today, as both the technology and internet speeds have improved, the technology is heavily utilized and has enabled considerable economic growth. Individuals can produce and distribute their own video content for widespread consumption and consumers can enjoy video content on the go and on more devices than ever before. It took far too long to reach that stage. And that's just a single example of how internet speeds can act as a gating – or enabling – function for the development and widespread consumer adoption of technology.

Slow internet speeds also appear to dampen adoption of computing devices. According to a Pew survey conducted in late 2016, rural Americans are 7 to 12 percentage points less likely than those in urban and suburban areas to say they have a smartphone, traditional computer, or tablet computer. According to the survey, "[t]hese comparably low levels of adoption among even high-income rural residents may be due to a unique feature of rural life. Even though rural areas are more wired today than in the past, substantial segments of rural America still lack the infrastructure needed for high-speed internet, and what access these areas do have tends to be slower than that of nonrural areas."[5]

[4] *See, e.g.,* Alex Zambelli, "A history of media streaming and the future of connected TV," The Guardian (Mar. 1, 2013), *available at*: < https://www.theguardian.com/media-network/media-network-blog/2013/mar/01/history-streaming-future-connected-tv>.

[5] *See* Andrew Perrin, "Digital gap between rural and nonrural America persists," Fact-Tank, Pew Research Center (May 19, 2017), *available at*: <http://www.pewresearch.org/fact-tank/2017/05/19/digital-gap-between-rural-and-nonrural-america-persists/>.

Looking ahead, slow internet speeds and poor broadband availability threaten more than computing device usage – they threaten to leave behind swaths of the country as the economy adopts the benefits and efficiencies of cloud computing. The growth of the cloud, and the technological capabilities it will enable, have some people describing the current era as the dawn of the Fourth Industrial Revolution. By enabling the collection, storage, and analysis of data at unprecedented scale, speed, and depth, the cloud makes it possible to find correlations that used to be too small to detect and discern the inner workings of systems that have been far too complicated to comprehend. With cloud computing and advanced analytic capabilities as a foundation, we are able to make rapid advances in artificial intelligence, robotics, genomics, materials sciences, 3-D printing, and much more. This, coupled with devices that connect us to information and one another at any time and from any location, means that opportunities to reimagine how businesses operate, connect with customers, and how people develop or consume products and services, are basically endless.

The transformative transition from strictly device-based software to cloud-based applications depends upon the availability of high-speed, high-quality internet connectivity. As cloud-based services become increasingly central to the day-to-day lives of Americans, the need for robust, ubiquitous, and affordable advanced telecommunications services becomes more critical and more central to everyday life. The move to the cloud – and harnessing the extraordinary benefits it offers – cannot happen without robust internet connectivity. To adopt cloud-based technology, Americans must be able to access and utilize remote computing capabilities without the modern equivalent of buffer wheels, dead spots, or overly expensive connectivity fees. Resting on existing speed benchmarks – or worse yet, reducing the speeds to

even more meager goals, as the Notice suggests – lacks the ambition that the statute envisions.[6] It is imperative for the Commission to recognize that its approach to implementing Section 706 will affect the health and robustness of the greater technology arena. Now is not the time to pause or rest. For the sake of continued technological development, to enable widescale consumer adoption of cutting edge technology, and to recognize Congress's ambition for the nation, the Commission must relentlessly promote faster, more ubiquitous fixed and mobile broadband internet connections – and not just one or the other – for ***all*** Americans. It is time to raise the bar and challenge ourselves to achieve more for everyone; not settle for the status quo.

II. The Commission Should Measure Affordability.

Affordability of advanced telecommunications capability is an important component of availability.[7] The measure of advanced telecommunications capability is not a theoretical exercise – it has the practical purpose of identifying where and how to "take immediate action

[6] *See, e.g.,* Notice at ¶ 14 (proposing – for application next year – the same benchmark for fixed services that was established 2 ½ years ago); *id.* at ¶¶ 19-20 (proposing use of speeds designed to determine eligibility for Mobility Fund participation). The minimum speeds established to determine Mobility Fund program eligibility were designed to mimic speeds generally already available in urban areas. *See Connect America Fund; Universal Service Reform – Mobility Fund*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 2152, ¶ 86 (2017) ("Our standards for supported service should ensure that our finite universal service funds are used efficiently to provide consumers access to robust mobile broadband service that is comparable to the 4G LTE service being offered today in urban areas."). That approach may be acceptable for a universal service program seeking to maximize eligibility options, but it lacks the ambition or growth potential that a future-looking aspiration should have under Section 706.

[7] *See* Notice at ¶ 31 (asking whether to evaluate reasonable and timely deployment to low-income Americans). The Notice also proposes to examine advanced telecommunications capability in all areas in the country, and to compare deployment across areas. *Id.* Whichever geographic unit is used for examination, it should permit the Commission to continue to examine availability in rural areas and Tribal lands and underperformance in those areas should trigger the statutory obligation for immediate action. 47 U.S.C. § 1302(b).

to accelerate deployment of such capability."[8] Congress was not interested in building last mile internet connections to nowhere; it clearly was interested in ensuring that all Americans could actually use advanced telecommunications capability.[9] As a practical matter, an internet connection that is unaffordable is an internet connection that is unavailable. That is, a gigabit internet connection that costs $1,000/month is one that is simply not available to most Americans. Accordingly, as part of its section 706 mandate, the Commission should measure affordability of advanced telecommunications capability.

Specifically, the Commission should compare the median cost of internet access services (of a reasonable, yet ambitious, minimum qualifying speed) available in each census tract (or relevant geographic unit) with the median household income in that geographic measurement unit. Then, the Commission could identify the areas where the combination of prices and incomes rendered advanced telecommunications capabilities unavailable to the residents in that geography. The United Nations Broadband Commission defines broadband as affordable if an entry-level (500MB) package is available at 5 percent or less of average monthly income,[10] which could serve as a measurement guide to the Commission. Microsoft encourages the Commission to collect sufficient information to make these demographic connections.[11]

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[8] 47 U.S.C. § 1302(b).

[9] Indeed, the statutory definition of "advanced telecommunications capability" references "enabl[ing] users." 47 U.S.C. § 1302(d)(1).

[10] *See, e.g.,* Broadband Commission for Digital Development, Broadband Targets for 2015, *available at*: <http://www.broadbandcommission.org/Documents/Broadband_Targets.pdf>.

[11] While the Commission should measure affordability to ascertain availability, determining what constitutes "advanced telecommunications capability" is a distinct inquiry. The Commission asks whether the speed benchmark for defining advanced telecommunications capability should be set at the level to which a certain percentage of residential customers subscribe. *See* Notice at ¶ 23. Consumer adoption patterns should not dictate the determination of what constitutes advanced telecommunications capability. The absence of competitive options, lock-in contracts, ISP pricing

III. Fixed and Mobile Modes of Access Are Not Substitutes for Each Other.

At present, Microsoft considers mobile broadband and fixed broadband services to be complementary (rather than substitutable or "separate and distinct") ways to achieve advanced telecommunications capability.[12] For purposes of the Section 706 inquiry, we believe the two modes of delivering services should be functionally equivalent if they are going to be considered as substitute means for achieving advanced telecommunications capability. However, as the Commission points out, "mobile and fixed broadband have different technical characteristic and limitations, and broadband providers choose to market their fixed and mobile products in different ways."[13]

When the Commission increased the speed benchmark for advanced telecommunications capability to 25 Mbps/3 Mbps, it did so, in large part, on its recognition that there may be multiple broadband users and devices in operation within an average household.[14] In addition, the Commission sought to take into full account the speeds required

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strategies, bundles, availability, and perceived marginal utility of greater speeds – that is, not knowing the benefits of having higher speed connections – are just some of the many factors could affect adoption levels of a certain speed tier. Moreover, establishing speed benchmarks at levels of existing subscribership would cement the status quo as the goal rather than aspiring to improvement for the nation's advanced telecommunications capabilities.

[12] Microsoft does not rule out that the two might be considered 'separate and distinct' ways of achieving advanced telecommunications capability in the future, but that will depend on market developments that have not yet occurred. *See* "*Broadband, Additional Stakeholder Input Could Inform FCC Actions to Promote Competition,*" Government Accountability Office Report to the Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, GAO-17-742, at 16 (Sept. 2017), *available at*: <http://www.gao.gov/assets/690/687244.pdf> ("According to experts and stakeholders we spoke to, fixed and mobile broadband services are not fully substitutable for one another, but may be in the future.").

[13] Notice at ¶ 10.

[14] *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act,* GN

for individuals to access advanced technological capabilities such as high-quality video, data, voice, and other broadband applications.[15] Fixed and mobile broadband today are becoming increasingly capable of delivering high-quality video, data, voice, and other broadband applications in a household with multiple residents, but those capabilities diverge with respect to important use cases and conditions.

- *Quality differential.* The Commission proposes lower speed benchmarks for mobile connections than for fixed connections.[16] 25 Mbps/3 Mbps speeds available over a fixed connection enable certain advanced technological capabilities that either are not possible or are not nearly as robust on a platform capable of only 10 Mbps /1 Mbps. For example, tethering a gaming console to a mobile broadband connection will not provide as good a user experience as a connection that is made through higher bandwidth wireline connectivity or the combination of wireline and Wi-Fi connectivity.
- *Data caps.* Data caps can and do exist for both fixed and mobile broadband services but, typically, they are lower for mobile services which means that consumers tend to encounter them more easily. A common practice, particularly among mobile operators with data caps, is to degrade the speed and/or application (*e.g.*, quality of video) that the customer receives. In such instances, the degraded form of service may no longer qualify as an advanced telecommunications capability. The Commission must consider the practical effect of data caps in evaluating whether mobile and fixed forms are delivery are, indeed, separate and distinct methods of achieving advanced telecommunications capabilities.
- *Simultaneous access by multiple devices in a household*: Tethering prohibitions that are commonly associated with unlimited mobile data plans would prevent an entire household from utilizing a mobile broadband connection simultaneously on separate devices as they could with a fixed connection. Under current market conditions, if the Commission were to equate fixed and mobile broadband as substitutes, it might erroneously deem a smartphone in the household as providing broadband service to the entire household when in fact it is available to only one device in the residence at any given time.

Docket No. 14-126, 2015 Broadband Progress Report and Notice of Inquiry on Immediate Action to Accelerate Deployment, 30 FCC Rcd 1375 at ¶ 3 (2015).

[15] *Id.*

[16] *See* Notice at ¶ 12 (proposing a fixed broadband benchmark of 25 Mbps/3 Mbps); *see id.* at ¶ 19 (seeking comment on "whether a mobile speed benchmark of 10 Mbps/1 Mbps is appropriate for mobile broadband services").

Notwithstanding the foregoing, the Commission must implement conforming measurement changes, too, before treating mobile and fixed advanced telecommunications capabilities as interchangeable ways of obtaining advanced telecommunications capability – specifically, the way that speed is measured and the geographic unit used for that measurement.

The ways in which individuals in households and businesses access broadband and the devices used to access broadband have evolved. Around the time the Commission was implementing the first 706 Report, users typically accessed advanced telecommunications services over a fixed connection to the premises from their desktop computer. Today, in the United States, there is a high likelihood that where there is a fixed broadband connection to the premises, there will be a 2.4 GHz and/or a 5 GHz Wi-Fi access point connected to its endpoint. Wi-Fi has enabled residential and business customers to leverage a fixed wireline connection to use their laptops, tablets, video game system, and even mobile phones 'nomadically' – that is, in proximity to a fixed broadband connection. In fact, much of advanced telecommunications capability delivered to devices is over Wi-Fi.[17] To these nomadic users, the broadband speed experienced is that to the Wi-Fi enabled device.

Fixed speed was and is measured by the speed delivered *to the premises*. The speed of mobile advanced telecommunications capability, by contrast, is measured by the speed delivered to the device. If the Commission were to consider fixed and mobile broadband as substitutes, it should conduct an apples-to-apples comparison of broadband speeds to the

[17] The Commission, as part of the Section 706 directive, should recognize this evolution in advanced telecommunications connectivity by preserving and improving unencumbered availability of unlicensed broadband spectrum for Wi-Fi usage.

device. Specifically, it should compare the end-to-end speed of a combined fixed and Wi-Fi broadband connection with that of a mobile broadband connection. If, as part of its Section 706 inquiry, the Commission chooses to measure broadband speed to the device, it will likely include a measurement and preservation of Wi-Fi as an essential component of advanced telecommunications services, since most wireline broadband data travels, in part, over unlicensed spectrum. The simpler approach would be to continue measuring speed to the premises – and excluding mobile broadband as a substitute.

In addition to conforming the method of measuring speed, the Commission also would need to conform the geographic unit utilized for measuring and reporting. Data about the availability of advanced telecommunications services is collected in different geographic units for fixed broadband services (census block level) and mobile broadband services (census tract level). Data collection at the census block level provides greater granularity on benchmark speeds than at the census tract level. If, notwithstanding Microsoft's recommendation to the contrary, the Commission adopts the position that fixed and mobile advanced telecommunications services are substitutes, it should measure their availability with the same level of geographic granularity. In this case, Microsoft would recommend that the Commission begin collecting data for mobile broadband services at the census block level, which would require a change to Form 477.

IV. The FCC Should Facilitate Use of TV White Spaces and Other Unlicensed Spectrum To Reduce the Broadband Gap in Rural America.

Any study of broadband availability in the United States could not credibly conclude that all Americans have reasonable access to advanced telecommunications capability. Indeed, Chairman Pai, shortly after assuming his role as Chairman, acknowledged that the digital divide

in the United States was one of the most significant things he had observed during his time at the Commission.[18] Rural America feels this divide acutely. More than two-thirds of Americans without a broadband connection live in rural areas.[19]

The rural broadband gap can and should be eliminated within five years. Microsoft, as part of its Rural Airband Initiative, has committed to invest in projects through partnerships with internet service providers with the goal of bringing broadband connectivity to 2 million people in rural America by 2022. With our partners, there will be at least 12 Rural Airband projects up and running in 12 states by July 2018.[20] TV White Spaces is a critical component of Microsoft's plan, and for bringing broadband to rural America more generally.

Microsoft worked with the Boston Consulting Group on a directional study about the best way to meet the broadband coverage needs of rural America. That study concluded that the best approach for the nation is to rely on a mixture of technologies for rural communities.[21] Specifically, TV white spaces will provide the best approach to reach the 80 percent of this underserved rural population that live in communities with a population density between two

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[18] Remarks of Ajit Pai, Chairman, Federal Communications Commission (Jan. 24, 2017), *available at* <https://apps.fcc.gov/edocs_public/attachmatch/DOC-343184A1.pdf>.

[19] Based on Form 477 data as of December 31, 2014 relied on by the FCC in its 2016 Broadband Progress Report. *See Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 15-191, 2016 Broadband Progress Report, 31 FCC Rcd 699, ¶ 79 (2016).

[20] Microsoft also will provide royalty-free access to at least 39 patents and sample source code it has developed to better enable broadband connectivity through TV White Spaces and is investing in a partnership with the National 4-H Council to training people on the latest technology. Additional details about Microsoft's Rural Airband Initiative can be found at <https://news.microsoft.com/rural-broadband/>.

[21] *See* "A Rural Broadband Strategy – Connecting Rural America to New Opportunities" at p. 12, *available at* <https://msblob.blob.core.windows.net/ncmedia/2017/07/Rural-Broadband-Strategy-Microsoft-Whitepaper-FINAL-7-10-17.pdf>.

and 200 people per square mile. Satellite coverage should be used for areas with a population density of less than two people per square mile, and non-TVWS fixed wireless frequencies and limited fiber for rural areas with greater density. By relying on this mixture of technologies, the total capital and initial operating cost to eliminate the rural broadband gap becomes significantly cheaper than relying solely on fiber or 4G LTE.

The Notice asks what additional efforts the Commission should undertake to encourage more expansive and rapid deployment of networks offering advanced telecommunications capability.[22] The Commission should support and promote the use of TV White Spaces to increase the affordability of private sector broadband deployments to rural America. Specifically, the Commission should take immediate measures to:

(1) ensure that at least three channels in the UHF frequency band below 700 MHz are available for wireless use on an unlicensed basis in every market in the country, with additional TV white spaces available in smaller markets and rural areas;

(2) accelerate the collection and public reporting on the state of broadband coverage in rural counties, thereby aiding policy makers and the private sector in targeting investments; and,

(3) design infrastructure investment programs, such as the CAF, so that they support use of unlicensed frequencies to deliver broadband to rural Americans.

[22] *See* Notice at ¶ 48.

V. Conclusion

Microsoft encourages the Commission to relentlessly and persistently encourage and incentivize making available advanced fixed and mobile telecommunications capabilities (not just one or the other) at continually improving speeds and increasing affordability for all Americans, consistent with the specific recommendations herein.

Respectfully submitted,

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